4. CONCEPTUAL EXPOSURE MODEL

The conceptual exposure model (CEM) provides the basis for a comprehensive evaluation of the risks to human health by identifying the mechanisms through which receptors may be exposed to residual constituents of potential concern (COPCs). The CEM traces the Parcel A COPCs in a logical flow from their sources through release mechanisms and exposure routes to the potentially affected receptors.

Of particular importance, the CEM identifies which exposure routes are complete and significant under the given land use. These significant pathways are used in the quantitative risk assessment for each receptor. The CEM also facilitates the analysis and screening of exposure pathways likely to pose only minor risks.

Section 4.1 presents the physical characteristics of Parcel A and describes the projected exposures associated with the construction and daily use of the parcel as a commercial/industrial facility. Section 4.2 discusses the possible routes by which Parcel A COPCs could be released to the environment and identifies the pathways significant to the quantification of potential receptor risk. A conceptual model for risk analysis is described that identifies the COPC sources, release mechanisms, potential receptor populations, and significant exposure pathways for the Parcel A land use and associated exposure scenarios

4.1 EXPOSURE SETTING

The specific characteristics of the Parcel A exposure setting influence the availability of COPCs to potential receptors, release mechanisms, exposure routes, and receptor activities. A receptor's actual exposure depends on the site's physical attributes and land use. While discussions of future land use are necessarily speculative, health-protective assumptions have been employed to

ensure that a reasonable maximum release of COPCs and, consequently, a reasonable maximum exposure concentration have been postulated.

4.1.1 Site Physical Characteristics

The physical characteristics of Parcel A are described in detail in several site investigation reports prepared for the entire C-6 property (e.g., WCC 1990 and K/J 1997). The following summarizes the published information as it relates to this risk assessment, with an emphasis on the post-demolition COPC sources, release mechanisms, exposure media, and exposure pathways for Parcel A. Highlights of area climate, meteorology, geological setting, soil types, hydrology, and local demographics are presented below.

4.1.1.1 Climate and Meteorology

The C-6 site is located in Los Angeles, California. Average annual temperature is 60 degrees Fahrenheit, ranging from 44 degrees in January to 111 degrees in September. Prevailing winds are from the west and west northwest. Wind speeds range from 4 to 10 knots (K/J 1996c).

4.1.1.2 Regional Geology and Hydrogeology

The site lies within the West Coast Basin, a major groundwater basin which underlies approximately 160 square miles of the coastal plain in southwestern Los Angeles County. Surface geology is characterized by Holocene Age sediments within the Torrance plain. The Torrance plain is defined as the area between Palos Verdes Hills to the south and the distinct belt of hills caused by folding and flexures along the Newport-Inglewood uplift to the north. The Pacific Ocean forms the western boundary of the basin, while the San Pedro Bay and Dominguez Gap form the eastern boundary. The site is underlain by Holocene and Pleistocene alluvium deposits that comprise the local hydrogeologic system described below (MW 1994).

Two geologic formations underlie the property: the Lakewood and the San Pedro. The Lakewood extends to a depth of approximately 180 feet bgs and contains two major hydrogeologic and

stratigraphic units known as the Bellflower aquiclude and the Gage aquifer (MW 1994). In the vicinity of the property, the Bellflower aquiclude is composed of low-permeability, late Pleistocene age sediments which lie above the Gage aquifer. Composed predominantly of silty clays, the Bellflower aquiclude extends to approximately 100 feet bgs (MW 1994, K/J 1996d).

The Gage aquifer underlies the Bellflower aquiclude and extends over the entire West Coast basin. In the vicinity of the C-6 site, the Gage is composed of water-bearing, fine-medium to coarse sand with variable amounts of coarse gravels and thin beds of silt and clay. The Gage aquifer is thought to have an approximate thickness of 30 to 40 feet and is encountered at approximately 150 feet bgs (MW 1994).

The San Pedro formation, which underlies the Lakewood formation, consists of lower Pleistocene deposits of marine origin and contains the Lynwood and Silverado aquifers. The San Pedro formation extends to a depth of approximately 1,000 feet bgs (K/J 1996d). The Lynwood aquifer has an approximate thickness of 90 feet and is encountered at a depth of about 310 feet beneath the site. The Silverado aquifer is encountered at a depth of approximately 520 feet bgs. The Silverado is considered a source of drinking water (K/J 1996d) and is the primary water source for the basin due to its high specific yield through the coarser sediments and its good water quality. The Silverado is continuous and merges with the Lynwood aquifer at the base of the El Segundo Sand Hills to the west (MW 1994).

Data collected from monitoring wells installed on the C-6 property indicate that groundwater flow in the region is generally to the southeast. Groundwater beneath the property occurs at approximately 65 feet bgs at the western boundary, flowing generally to the southeast and bending to the south (K/J 1996a, 1996b, 1996c).

4.1.2 Post-Demolition Land Use and Associated Exposure Scenarios

As mentioned, for the purpose of defining potential receptor exposures, this report assumes a single, post-demolition land use for Parcel A as a commercial/industrial facility. Given this land

use, two post-demolition exposure scenarios are examined, one associated with construction of the facility (the *construction scenario*), the other associated with its operation (the *commercial/industrial scenario*).

The commercial/industrial land use is consistent with the zoning and deed restrictions to be implemented at Parcel A. While final decisions concerning the exact commercial/industrial uses of the parcel have not been made, reasonable and conservative assumptions concerning potential commercial/industrial uses and facility construction were employed in the development of the exposure scenarios. In this way, the estimated risk values effectively provide a range of anticipated exposures. In developing the exposure scenarios, it was assumed that:

- All construction activities will be completed within 1 year.
- During construction, access controls and security will minimize trespassing.
- After development, the parcel will not have access controls.
- After development, all surfaces will be capped with cement or asphalt (for building foundation, roadways, or parking areas) or covered with vegetation (landscaping).
- All soil containing residual concentrations of COPCs will be covered with at least 2 feet of imported clean soil.

These assumptions are consistent with the scheduled development project and the need to raise the site for proper drainage.

4.1.3 Reasonable Maximum Exposure

EPA (1989a) recommends the use of reasonable maximum exposure (RME) to express the highest exposure that could reasonably occur at a site. As a conservative estimate, the RME is within the range of possible exposures but higher than the typical or average exposure. RMEs are estimated for individual pathways. If a population is exposed to more than one pathway, the sum of the exposures across pathways also represents the RME (EPA 1989a).

Populations potentially affected by site COPCs include people of various ages and lifestyles who live or conduct business at or near the site. Instead of estimating health impacts to a specific individual, this report evaluates potential health effects to representative receptor groups. Each receptor in this risk assessment has been developed to conservatively represent the upper-bound exposures to a group of people that have similar lifestyles or perform similar daily activities. If the risk to the selected receptor is determined to be acceptable, then it is likely that all other receptors within the group with lesser exposures will also be acceptable.

4.2 Conceptual Exposure Model for Parcel A

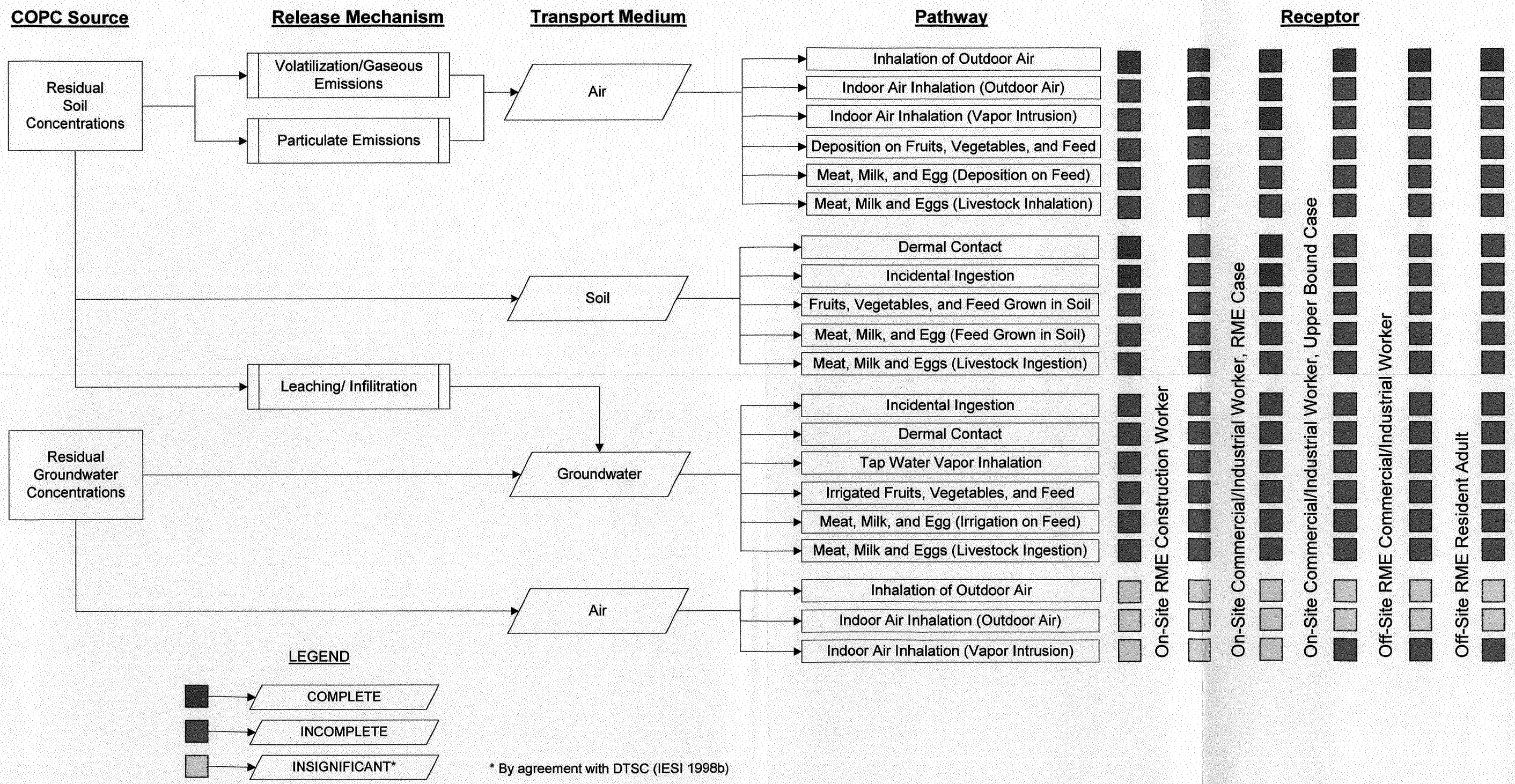
Figure 4-1 presents the CEM developed to describe the Parcel A exposure setting after demolition, under the construction and commercial/industrial exposure scenarios. Given these scenarios, there are several potential exposure pathways through which a receptor may come in contact with COPCs at Parcel A. Four elements must be present for an exposure pathway to be deemed complete: 1) COPC source, 2) exposure pathway, 3) receptor, and 4) release mechanism. The following sections provide details on these subjects.

4.2.1 COPC Sources

Discussion of COPC sources provides a starting point for the development of the exposure pathways. As described in Section 2.1, the COPC sources considered in this report include:

- Residual concentrations in backfilled and undisturbed areas within the top 12 feet of soil
- Soil COPCs left unexcavated from 12 feet bgs to the top of the Bellflower aquiclude
- Existing COPCs in the Bellflower aquiclude

The CEM (Figure 4-1) addresses all COPCs found at or originating from Parcel A. Under the given land use, the environmental media may act as reservoirs for COPCs that slowly migrate to other environmental compartments or may serve as a direct or indirect source of human exposure.



* By agreement with DTSC (IESI 1998b)

FIGURE 4-1
CONCEPTUAL EXPOSURE MODEL (CEM), POST-DEMOLITION PARCEL A